COPPER AND SELENIUM REQUIREMENTS OF FEEDLOT CATTLE WHERE WATER IS HIGH IN SULPHATES

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FINAL REPORT

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In this project, we set out to demonstrate the benefits of copper to feedlot animals where water is high in sulphates. Due to the interaction between copper and selenium, we included the following treatments: copper, selenium, copper and selenium, and a check (no copper or selenium).

It was expected the copper and selenium treatment would perform the best when in fact their growth rate turned out to be the poorest. There did seem to be an economic response to the copper and selenium when administered seperately.

The major question arising out of this project is whether the animals purchased were indeed deficient in copper. Apparently, animals can store enough copper in their liver to provide the necessary copper required during the feeding period. Future projects would require blood testing to establish the copper status at the start of the test.

If you would like further information, feel free to contact:

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(D-88-01-0364)

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As livestock producers strive for improved rates of gain in feedlot cattle, copper and selenium deficiencies have shown up in areas where water supplies are high in sulphates. This seems to be especially true in fast growing exotic-cross cattle.

In this project we compared the growth rate of animals which were given the following treatments: (1) Selenium (2) Copper (Coprin) (3) Copper and Selenium (4) Check with neither Copper or Selenium.

The steers were all purchased at a green tag sale and weighed into the feedlot on December 14th. As the steers were being processed to go on feed, each animal was given one of the above mentioned treatments.

Results of the project can be found in Appendix A.

As you scan through the results, you will notice that the gains of a number of animals have been registered at zero. The reason for this is that a number of animals lost their eartags. As a result, their gains were left out of the calculations.

When you analyze the results, you'll see the only treatments outperforming the check (no copper or selenium) were the copper treatment and the selenium treatment. For whatever reason, the copper and selenium treatment produced the poorest results of any of the treatments.

The economic returns over and above the treatments were as follows:

1. Selenium Treatment
   [(ADG of SE - ADG of Check) x average # of days on test]
   x $0.88/lb - cost of SE

   [(2.8873333 - 2.8532743) x 157.27] x $0.88 - $1.40
   = $3.31

2. Copper Treatment
   [(ADG of Cu - ADG of Check) x average # of days on test]
   x $0.88/lb - cost of Cu

   [(2.8969565 - 2.8532743) x 131.91] x $0.88 - $4.50
   = $0.57

3. Copper and Selenium Treatment
   [(ADG of Cu & SE - ADG of Check) x average # of days on test]
   x $0.88/lb - cost of Cu & SE

   [(2.8336585 - 2.8532743) x 145.42] x $0.88 - $5.90
   = -$8.41

From these calculations it would appear there was an economic response to the selenium and copper when used seperately but not when used together. We have to be fairly careful with how much faith we put in some of these numbers because of the fairly small sample size. This is especailly true in the case of selenium which only had 15 animals.

I find it difficult to understand why the copper and selenium treatment which should have shown the best response, resulted in the poorest gains. Possibly the animals purchased all had adequate copper supplies in their livers which carried them through the feeding period. However, they still should have done at least as well as the selenium group.

I feel this project should be repeated using a cheaper, more common form of copper and at the same time monitoring the blood copper levels of some of the animals to determine indeed if they are lacking copper as a result of the high sulphate water. Also, more care should be taken to purchase animals from areas known to be copper deficient.

APPENDIX "A"

EAR TAG #	BREED	TREATMENT	THE ON-FEED WEIGHTS ON DECEMBER 21 ST. SE	CU	CU&SE	CHECK	FINAL WT.	SALE DATE	A.D.G.'s OF SE	A.D.G.'S OF CU	A.D.G.'S OF CU&SE	A.D.G.'S OF CHECK
184	RWF	CU&SE	0	0	690	0	1040	MAY 29	0	0	2.11	0
185	RWF	SE	660	0	0	0	1235	JUNE 20	3.06	0	0	0
186	RWF	CU&SE	0	0	555	0	1000	MAY 4	0	0	3.16	0
187	RWF	SE	595	0	0	0	1060	MAY 29	2.8	0	0	0
188	RWF	CU&SE	0	0	600	0	1060	MAY 29	0	0	2.77	0
189	RWF	SE	695	0	0	0	1000	MAY 4	2.16	0	0	0
190	RWF	CU&SE	0	0	620	0	1000	MAY 4	0	0	2.7	0
191	RWF	CHECK	0	0	0	695	1080	MAY 4	0	0	0	3
192	RWF	CU&SE	0	0	615	0	1220	JUNE 20	0	0	3.22	0
193	RWF	SE	655	0	0	0	970	MAY 4	2.23	0	0	0
194	RWF	CU&SE	0	0	665	0	1030	MAY 4	0	0	2.59	0
195	RWF	SE	680	0	0	0	1100	MAY 29	2.53	0	0	0
196	RWF	CU&SE	0	0	620	0	1210	JUNE 20	0	0	3.14	0
197	RWF	SE	580	0	0	0	1035	MAY 29	2.74	0	0	0
198	RWF	CU&SE	0	0	645	0	1090	MAY 29	0	0	2.68	0
199	RWF	SE	655	0	0	0	1095	APRIL19	3.49	0	0	0
200	RWF	CU&SE	0	0	580	0	1195	JUNE 20	0	0	3.27	0
201	RWF	SE	720	0	0	0	1170	MAY 29	2.71	0	0	0
202	RWF	CU&SE	0	0	635	0	1025	MAY 4	0	0	2.77	0
203	RWF	SE	630	0	0	0	1080	MAY 29	2.71	0	0	0
204	RWF	CU&SE	0	0	660	0	1250	JUNE 20	0	0	3.14	0
205	RWF	SE	655	0	0	0	1275	JUNE 20	3.3	0	0	0
206	RWF	CU&SE	0	0	680	0	1175	MAY 29	0	0	2.98	0
207	RWF	SE	595	0	0	0	1080	MAY 4	3.44	0	0	0
208	RWF	CU&SE	0	0	680	0	1065	MAY 4	0	0	2.73	0
209	RBF	SE	620	0	0	0	1035	MAY 4	2.94	0	0	0
210	RWF	CU&SE	0	0	640	0	1190	JUNE 20	0	0	2.93	0
211	RWF	SE	580	0	0	0	1080	MAY 29	3.01	0	0	0
212	RWF	CU&SE	0	0	605	0	1040	MAY 29	0	0	2.62	0
213	RWF	SE	620	0	0	0	1135	MAY 29	3.1	0	0	0
214	RWF	CU&SE	0	0	615	0	1130	JUNE 20	0	0	2.74	0
215	RWF	CHECK	0	0	0	585	1030	MAY 4	0	0	0	3.16
216	RWF	CU&SE	0	0	660	0	1175	JUNE 20	0	0	2.74	0
217	RWF	CHECK	0	0	0	700	1100	APRIL19	0	0	0	3.17
218	RWF	CU&SE	0	0	660	0	1095	MAY 4	0	0	3.09	0
219	RWF	CHECK	0	0	0	680	1020	APRIL19	0	0	0	2.7
220	RWF	CU&SE	0	0	640	0	1050	MAY 4	0	0	2.91	0
221	RWF	CHECK	0	0	0	580	1165	JUNE 20	0	0	0	3.11
222	RWF	CU&SE	0	0	630	0	1060	MAY 4	0	0	3.05	0
223	RWF	CHECK	0	0	0	615	990	MAY 4	0	0	0	2.66
224	RWF	CU&SE	0	0	625	0	1055	JUNE 20	0	0	2.29	0
225	RWF	CHECK	0	0	0	675	1170	JUNE 20	0	0	0	2.63
226	RWF	CU&SE	0	0	640	0	1000	MAY 4	0	0	2.55	0
227	RWF	CHECK	0	0	0	615	1100	MAY 29	0	0	0	2.92
228	RWF	CU&SE	0	0	680	0	1230	JUNE 20	0	0	2.93	0
229	RWF	CHECK	0	0	0	570	1105	MAY 29	0	0	0	3.22
230	RWF	CU&SE	0	0	600	0	1030	MAY 29	0	0	2.59	0
231	RWF	CHECK	0	0	0	655	1000	MAY 4	0	0	0	2.45
232	RWF	CU&SE	0	0	680	0	1110	MAY 29	0	0	2.59	0
233	RWF	CHECK	0	0	0	700	1120	APRIL19	0	0	0	3.33
234	RWF	CU&SE	0	0	590	0	1050	MAY 4	0	0	3.26	0
235	RWF	CHECK	0	0	0	585	1115	MAY 29	0	0	0	3.19
236	RWFBU	CU&SE	0	0	790	0	1135	APRIL19	0	0	2.74	0
237	BU	CHECK	0	0	0	750	1220	APRIL24	0	0	0	3.59
238	WHITE	CU&SE	0	0	735	0	1325	JUNE 20	0	0	3.14	0
239	BUWF	CHECK	0	0	0	720	1240	APRIL19	0	0	0	4.13
240	BUWF	CU&SE	0	0	730	0	1130	MAY 29	0	0	2.41	0

242	WHITE	CU&SE	0	0	680	0	1240	MAY 29	0	0	3.37	0
243	BUWF	CHECK	0	0	0	680	1110	MAY 4	0	0	0	3.05
244	BUWF	CU&SE	0	0	750	0	1070	MAY 4	0	0	2.27	0
245	BUBF	CHECK	0	0	0	700	1140	APRIL19	0	0	0	3.49
246	BU	CU&SE	0	0	725	0	1250	MAY 29	0	0	3.16	0
247	RBF	CHECK	0	0	0	690	1150	MAY 29	0	0	0	2.77
248	BUWF	CU&SE	0	0	740	0	1175	MAY 4	0	0	3.09	0
249	WHITE	CHECK	0	0	0	735	1265	MAY 29	0	0	0	3.19
250	BU	CU&SE	0	0	645	0	1110	MAY 4	0	0	3.3	0
251	WHITE	CHECK	0	0	0	735	1375	JUNE 20	0	0	0	3.4
252	WHITE	CU&SE	0	0	635	0	1285	JUNE 20	0	0	3.46	0
253	WHITE	CHECK	0	0	0	740	1175	APRIL19	0	0	0	3.45
254	WHITE	CU&SE	0	0	680	0	1130	MAY 29	0	0	2.71	0
255	BUWF	CHECK	0	0	0	615	1105	MAY 4	0	0	0	3.48
256	BR	CU&SE	0	0	765	0	1190	MAY 4	0	0	3.01	0
257	WHITE	CHECK	0	0	0	840	1210	APRIL19	0	0	0	2.94
258	BU	CU&SE	0	0	690	0	1310	JUNE 20	0	0	3.3	0
259	WHITE	CHECK	0	0	0	615	1100	MAY 29	0	0	0	2.92
260	WHITE	CU&SE	0	0	730	0	1230	APRIL19	0	0	3.97	0
261	WHITE	CHECK	0	0	0	715	1275	MAY 29	0	0	0	3.37
262	BUBF	CU&SE	0	0	730	0	1210	MAY 4	0	0	3.4	0
263	BUBF	CHECK	0	0	0	665	1095	MAY 4	0	0	0	3.05
264	BU	CU&SE	0	0	655	0	1160	MAY 29	0	0	3.04	0
265	BUWF	CHECK	0	0	0	695	1100	MAY 4	0	0	0	2.87
266	BU	CU&SE	0	0	780	0	1175	APRIL19	0	0	3.13	0
267	WHITE	CHECK	0	0	0	650	1125	JUNE 20	0	0	0	2.53
268	BU	CU&SE	0	0	710	0	1045	APRIL19	0	0	2.66	0
269	WHITE	CHECK	0	0	0	635	1205	JUNE 20	0	0	0	3.03
270	BUWF	CU&SE	0	0	690	0	1105	MAY 4	0	0	2.94	0
271	CWF	CHECK	0	0	0	725	1060	MAY 4	0	0	0	2.38
272	BUWF	CU&SE	0	0	735	0	1115	MAY 4	0	0	2.7	0
273	BUWF	CHECK	0	0	0	765	1175	APRIL19	0	0	0	3.25
274	BU	CU&SE	0	0	765	0	1190	MAY 4	0	0	3.01	0
275	BU	CHECK	0	0	0	690	1200	MAY 29	0	0	0	3.07
276	BUWF	CU&SE	0	0	770	0	1215	APRIL19	0	0	3.53	0
277	WHITE	CHECK	0	0	0	740	1200	MAY 29	0	0	0	2.77
278	BU	CU	0	720	0	0	1250	JUNE 20	0	2.82	0	0
279	BUWF	CHECK	0	0	0	750	1185	APRIL19	0	0	0	3.45
280	BU	CU	0	765	0	0	1240	MAY 29	0	2.86	0	0
281	BUWF	CHECK	0	0	0	715	1105	MAY 4	0	0	0	2.35
282	WHITE	CU	0	765	0	0	1240	MAY 29	0	2.86	0	0
283	BUBF	CHECK	0	0	0	715	1180	APRIL19	0	0	0	3.69
284	BU	CU	0	680	0	0	1165	APRIL19	0	3.85	0	0
285	WHITE	CHECK	0	0	0	770	1215	APRIL19	0	0	0	3.53
286	BUWF	CU	0	660	0	0	1100	MAY 4	0	3.12	0	0
287	BUWF	CHECK	0	0	0	690	1145	APRIL24	0	0	0	3.47
288	BU	CU	0	770	0	0	1160	MAY 4	0	2.77	0	0
289	WHITE	CHECK	0	0	0	690	1220	MAY 29	0	0	0	3.19
290	WHITE	CU	0	765	0	0	1320	MAY 29	0	3.34	0	0
291	BU	CHECK	0	0	0	760	1280	APRIL19	0	0	0	4.13
292	BU	CU	0	660	0	0	1155	MAY 29	0	2.98	0	0
293	BU	CHECK	0	0	0	680	1150	MAY 29	0	0	0	2.83
294	BUWF	CU	0	730	0	0	1290	JUNE 20	0	2.98	0	0
295	BUBF	CHECK	0	0	0	755	1175	MAY 29	0	0	0	2.53
296	WHITE	CU	0	690	0	0	1250	JUNE 20	0	2.98	0	0
297	BU	CHECK	0	0	0	750	1160	APRIL19	0	0	0	3.25
298	CHARROAN	CU	0	745	0	0	1150	APRIL19	0	3.21	0	0
299	WHITE	CHECK	0	0	0	760	1220	MAY 29	0	0	0	2.77
300	BUBF	CU	0	685	0	0	1240	APRIL19	0	4.4	0	0
301	BUBF	CHECK	0	0	0	665	1105	MAY 29	0	0	0	2.65
302	BU	CU	0	735	0	0	1140	MAY 4	0	2.87	0	0

304	BU	CU	0	670	0	0	1290	JUNE 20	0	3.3	0	0
305	WHITE	CHECK	0	0	0	600	1175	JUNE 20	0	0	0	3.06
306	BUWF	CU	0	760	0	0	1135	APRIL19	0	2.98	0	0
307	WHITE	CHECK	0	0	0	610	1030	MAY 29	0	0	0	2.53
308	GREYBF	CU	0	685	0	0	1200	MAY 29	0	3.1	0	0
309	BUWF	CHECK	0	0	0	615	0	LOSTTAG	0	0	0	0
310	CHARRWF	CU	0	630	0	0	830	MARCH14	0	2.22	0	0
311	CWF	CHECK	0	0	0	650	900	MARCH14	0	0	0	2.78
312	RED	CU	0	710	0	0	910	MARCH14	0	2.22	0	0
313	CHARBRIN	CHECK	0	0	0	625	1085	JUNE 20	0	0	0	2.45
314	CWF	CU	0	610	0	0	880	MARCH14	0	3	0	0
315	MOUSE	CHECK	0	0	0	630	845	MARCH14	0	0	0	2.39
316	BU	CU	0	705	0	0	1145	MAY 29	0	2.65	0	0
317	BUWF	CHECK	0	0	0	675	1120	MAY 29	0	0	0	2.68
318	BWWF	CU	0	615	0	0	1075	MAY 29	0	2.77	0	0
319	WHITE	CHECK	0	0	0	665	890	MARCH14	0	0	0	2.5
320	BU	CU	0	650	0	0	860	MARCH14	0	2.33	0	0
321	WHITE	CHECK	0	0	0	545	1015	MAY 29	0	0	0	2.83
322	BUWF	CU	0	635	0	0	890	MARCH14	0	2.83	0	0
323	BU	CHECK	0	0	0	665	980	MARCH14	0	0	0	3.5
324	WHITE	CU	0	635	0	0	915	MARCH14	0	3.11	0	0
325	CWF	CHECK	0	0	0	560	925	MAY 29	0	0	0	2.2
326	BU	CU	0	680	0	0	960	MARCH 4	0	3.5	0	0
327	BU	CHECK	0	0	0	635	0	LOSTTAG	0	0	0	0
328	BUWF	CU	0	690	0	0	975	MAY 29	0	1.72	0	0
329	CWF	CHECK	0	0	0	655	850	MARCH14	0	0	0	2.17
330	BUWF	CU	0	670	0	0	915	MARCH14	0	2.72	0	0
331	WHITE	CHECK	0	0	0	605	1025	JUNE 20	0	0	0	2.23
332	WHITE	CU	0	655	0	0	940	MARCH14	0	3.17	0	0
333	BUWF	CHECK	0	0	0	700	900	MARCH14	0	0	0	2.22
334	BUWF	CU	0	655	0	0	1100	MAY 29	0	2.68	0	0
335	CWF	CHECK	0	0	0	590	840	MARCH14	0	0	0	2.78
336	CBF	CU	0	630	0	0	870	MARCH 4	0	3	0	0
337	CHAR	CHECK	0	0	0	600	1010	MAY 29	0	0	0	2.47
338	BU	CU	0	690	0	0	1235	JUNE 20	0	2.9	0	0
339	BU	CHECK	0	0	0	615	1030	MAY 29	0	0	0	2.5
340	BU	CU	0	655	0	0	950	MARCH14	0	3.28	0	0
341	BUBF	CHECK	0	0	0	655	1055	MAY 29	0	0	0	2.41
342	BUWF	CU	0	630	0	0	830	MARCH14	0	2.22	0	0
343	CBF	CHECK	0	0	0	690	1095	MAY 29	0	0	0	2.44
344	BU	CU	0	655	0	0	1130	MAY 29	0	2.86	0	0
345	BUBF	CHECK	0	0	0	670	875	MARCH14	0	0	0	2.28
346	BUBF	CU	0	610	0	0	870	MARCH14	0	2.89	0	0
347	BUWF	CHECK	0	0	0	580	950	MAY 29	0	0	0	2.23
348	BU	CU	0	625	0	0	835	MARCH14	0	2.33	0	0
349	BUBF	CHECK	0	0	0	660	910	MARCH14	0	0	0	2.78
350	BU	CU	0	595	0	0	1015	MAY 29	0	2.53	0	0
351	CHAR&W	CHECK	0	0	0	615	845	MARCH14	0	0	0	2.56
352	WHITE	CU	0	620	0	0	0	LOSTTAG	0	0	0	0
353	BUWF	CHECK	0	0	0	575	870	MARCH14	0	0	0	3.28
354	BUBF	CU	0	625	0	0	860	MARCH14	0	2.61	0	0
355	BU	CHECK	0	0	0	630	0	LOSTTAG	0	0	0	0
356	BUWF	CU	0	605	0	0	850	MARCH 4	0	3.06	0	0
357	CHAR	CHECK	0	0	0	610	840	MARCH14	0	0	0	2.56
358	BUBF	CU	0	620	0	0	880	MARCH14	0	2.89	0	0
359	BU	CHECK	0	0	0	680	920	MARCH14	0	0	0	2.67
360	WHITE	CU	0	630	0	0	1110	JUNE 20	0	2.55	0	0
361	BUWF	CHECK	0	0	0	590	975	MAY 29	0	0	0	2.32
362	BU	CU	0	660	0	0	1195	JUNE 20	0	2.85	0	0
363	CHARBF	CHECK	0	0	0	720	1155	MAY 29	0	0	0	2.62
364	RWFSIM	CU	0	680	0	0	1235	JUNE 20	0	2.95	0	0

366	CWF	CU	0	640	0	0	880	MARCH14	0	2.67	0	0
367	CHARSIM	CHECK	0	0	0	660	1080	JUNE 20	0	0	0	2.23
368	CHARROAN	CU	0	675	0	0	975	MARCH14	0	3.33	0	0
369	RED	CHECK	0	0	0	720	1100	MAY 29	0	0	0	2.29
370	CWF	CU&SE	0	0	670	0	1090	MAY 29	0	0	2.53	0
371	CWF	CHECK	0	0	0	615	885	MARCH14	0	0	0	3
372	CWF	CU&SE	0	0	625	0	1025	MAY 29	0	0	2.41	0
373	GREYWF	CHECK	0	0	0	670	1170	MAY 29	0	0	0	3.01
374	BUWF	CU&SE	0	0	735	0	1095	MAY 29	0	0	2.17	0
375	BUBF	CHECK	0	0	0	660	1160	JUNE 20	0	0	0	2.66
376	CHAR	CU&SE	0	0	630	0	1070	MAY 29	0	0	2.65	0
377	CHARBF	CHECK	0	0	0	655	1095	MAY 29	0	0	0	2.65
378	CWF	CU&SE	0	0	640	0	1100	MAY 29	0	0	2.77	0
379	CHAR	CHECK	0	0	0	610	1135	MAY 29	0	0	0	3.16
380	WHITE	CU&SE	0	0	615	0	845	MARCH14	0	0	2.56	0
381	CHARBF	CHECK	0	0	0	690	1175	MAY 29	0	0	0	2.92
382	BUBF	CU&SE	0	0	670	0	1025	MAY 29	0	0	2.14	0
383	RWFSIM	CHECK	0	0	0	660	1080	MAY 29	0	0	0	2.53
384	CWF	CU&SE	0	0	660	0	1075	JUNE 20	0	0	2.21	0
385	R&W	CHECK	0	0	0	685	920	MARCH14	0	0	0	2.61
386	O&W	CU&SE	0	0	625	0	1010	MAY 29	0	0	2.32	0
387	BUWF	CHECK	0	0	0	675	1170	JUNE 20	0	0	0	2.63
388	BUWF	CU&SE	0	0	590	0	1000	MAY 29	0	0	2.47	0
389	RBF	CHECK	0	0	0	620	1075	MAY 29	0	0	0	2.74
390	RWFSIM	CU&SE	0	0	630	0	1075	MAY 29	0	0	2.68	0
391	BUWF	CHECK	0	0	0	635	1060	JUNE 20	0	0	0	2.26
392	BUBF	CU&SE	0	0	630	0	950	MARCH14	0	0	3.56	0
393	RWFSIM	CHECK	0	0	0	645	890	MARCH14	0	0	0	2.72
394	R&WSIM	CU&SE	0	0	690	0	1120	JUNE 20	0	0	2.29	0
395	BUWF	CHECK	0	0	0	685	1310	MAY 29	0	0	0	3.77
396	BUWF	CU&SE	0	0	605	0	865	MARCH14	0	0	2.89	0
397	RBF	CHECK	0	0	0	635	1025	MAY 29	0	0	0	2.35
398	BUWF	CU&SE	0	0	695	0	985	MARCH14	0	0	3.22	0
399	RWFSIM	CHECK	0	0	0	670	940	MARCH14	0	0	0	3
400	RBF	CU&SE	0	0	690	0	920	MARCH14	0	0	2.56	0
401	CHAR	CHECK	0	0	0	675	1160	JUNE 20	0	0	0	2.58
402	RBF	CU&SE	0	0	635	0	880	MARCH 4	0	0	3.06	0
403	BU	CHECK	0	0	0	720	1220	JUNE 20	0	0	0	2.66
404	CHARSIM	CU&SE	0	0	615	0	1125	MAY 29	0	0	3.07	0
405	CHAR	CHECK	0	0	0	665	1165	MAY 29	0	0	0	3.01
406	RBF	CU&SE	0	0	690	0	1145	MAY 29	0	0	2.74	0
407	GWF	CHECK	0	0	0	600	990	MAY 29	0	0	0	2.35
408	RWF	CU&SE	0	0	690	0	1065	MAY 29	0	0	2.26	0
409	CWF	CHECK	0	0	0	630	855	MARCH 4	0	0	0	2.81
410	CBF	CU&SE	0	0	715	0	900	MARCH 9	0	0	2.18	0
411	RWFSIM	CHECK	0	0	0	640	1115	JUNE 20	0	0	0	2.53
412	CWF	CU&SE	0	0	655	0	855	MARCH14	0	0	2.22	0
413	BU	CHECK	0	0	0	720	0	$DIED$	0	0	0	0
414	RBFSIM	CU&SE	0	0	685	0	1100	MAY 29	0	0	2.5	0
415	REDBF	CHECK	0	0	0	583	990	MAY 29	0	0	0	2.45
416	WHITE	CU&SE	0	0	695	0	1010	MARCH14	0	0	3.5	0
417	CBF	CHECK	0	0	0	650	910	MARCH14	0	0	0	2.89
418	CWF	CU&SE	0	0	690	0	940	MARCH 4	0	0	3.13	0
419	BUWF	CHECK	0	0	0	730	960	MARCH14	0	0	0	2.56
420	BUBF	CU&SE	0	0	710	0	1065	MAY 29	0	0	2.14	0
421	BUWF	CHECK	0	0	0	675	955	MARCH14	0	0	0	3.11
593	B	CHECK	0	0	0	660	1115	MAY 30	0	0	0	2.72
594	B	CU&SE	0	0	650	0	1075	APRIL24	0	0	3.24	0
595	B	CHECK	0	0	0	730	1140	APRIL24	0	0	0	3.13
596	B	CU&SE	0	0	600	0	1065	JUNE 12	0	0	2.58	0
597	B	CHECK	0	0	0	640	1150	JUNE 12	0	0	0	2.83
[illegible]	[illegible]	[illegible]	[illegible]	0	0	0	[illegible]	APRIL24	7.88	0	0	0

599	B	CHECK	0	0	0	660	1135	MAY 30	0	0	0	2.84
600	B	CU&SE	0	0	630	0	1085	MAY 30	0	0	2.72	0
601	B	CHECK	0	0	0	650	1110	MAY 30	0	0	0	2.75
602	B	CU&SE	0	0	630	0	1050	APRIL24	0	0	3.21	0
603	B	CHECK	0	0	0	650	1090	APRIL24	0	0	0	3.36
604	B	CU	0	770	0	0	1200	APRIL24	0	3	0	0
605	B	CHECK	0	0	0	590	1035	JUNE 12	0	0	0	2.47
606	B	CU&SE	0	0	615	0	1070	APRIL24	0	0	3.47	0
607	B	CHECK	0	0	0	655	1250	JUNE 12	0	0	0	3.31
608	B	CU&SE	0	0	755	0	1090	APRIL19	0	0	2.66	0
609	B	CHECK	0	0	0	630	1100	MAY 30	0	0	0	2.81
610	B	CU&SE	0	0	760	0	1195	APRIL19	0	0	3.45	0
611	B	CHECK	0	0	0	650	1065	APRIL24	0	0	0	3.17
612	B	CU&SE	0	0	530	0	950	JUNE 12	0	0	2.33	0
613	B	CHECK	0	0	0	725	1135	APRIL24	0	0	0	3.13
614	B	CU&SE	0	0	650	0	1115	JUNE 12	0	0	2.58	0
615	B	CHECK	0	0	0	690	1050	APRIL19	0	0	0	2.86

VERAGE IN WT. OF THE SEL. TREATMENT = 640

VERAGE IN WT. OF THE CU. TREATMENT = 687.82609

VERAGE IN WT. OF THE CU & SEL TRT. = 666.34146

VERAGE IN WEIGHT OF THE CHECK TRT. = 690.02655

VERAGED GAINS OF THE SELENIUM GROUP = 2.8873333

VERAGED GAINS OF THE COPPER GROUP = 2.9969565

VERAGED GAINS OF THE CU & SEL GROUP = 2.8336585

VERAGED GAINS OF THE CHECK GROUP = 2.8532743